BIBB (R.H.L.)

The Nature and Treatment of Leprosy.

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THE NATURE AND TREATMENT OF LEPROSY.[1]

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ALTHOUGH it has been confounded with many affections of the skin, and known by a variety of names, history teaches that, since Moses wrote of "the laws and tokens whereby the priest is to be guided in discerning the leprosy," this vile disease, this unclean scourge has appeared, in a greater or lesser degree, among all nations and conditions of people—mid polar snows and equatorial sands; from the Orient unto the Occident.

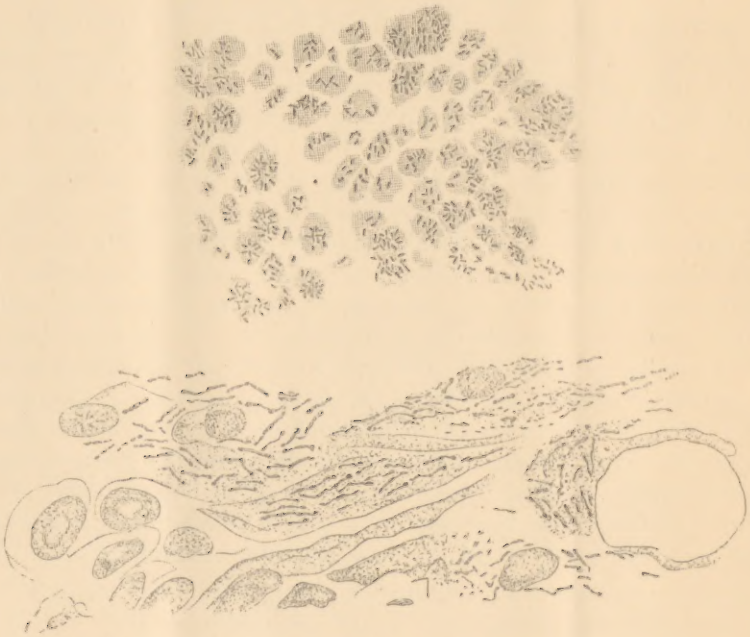
It is not, however, the purpose of this paper to enter into minute historical detail, nor to trace the dissemination of leprosy down through succeeding ages—for it is well known that, from about the beginning of the Christian era to the end of the sixteenth century, it had overrun all Europe, and that before the end of the seventeenth it had been almost wholly eradicated from among the more civilized portions of that continent; its intent will have been subserved if the writer can, from the observations of other competent, painstaking investigators, coupled with his own, cast even a modicum of light upon the nature of a disease whose terrible ravages in times past dethroned kings and made social and political exiles of rulers, prelates, and subjects—a disease the mention of which even yet suffices to create consternation in the stoutest hearts.

At the present time—notwithstanding the fact that no disease was ever regarded with equal abhorrence; notwithstanding that it was once almost entirely exterminated; notwithstanding the rapid advances in civilization, in the arts, and in the sciences; and notwithstanding the earnest efforts, in all ages, of hundreds of noble, self-sacrificing men and women, in and out of the medical profession—it is a lamentable fact, one that should mantle humanity's cheek with the blush of deepest shame, that leprosy exists, throughout the civilized as well as the uncivilized world, as an endemic disease; prevailing as such, however, more extensively in France, Spain, Portugal, Norway, Sweden, Italy, Greece, Russia, China, Asia, Africa, the islands of the Indian and Pacific Oceans, Japan, New Zealand, Australia, Madeira, the West Indies, Central and South America, Cuba, Mexico, the Hawaiian Islands, New Brunswick, and some portions of the United States.

[1] Awarded the Alvarenga Prize for 1892, by the Philadelphia College of Physicians.

Hansen's discovery, that a particular bacillus is invariably associated with leprosy, has been abundantly confirmed from every quarter of the globe. Thus, Mitra,[1] Rake,[2] Donovan,[3] Kaurin,[4] Arning,[5] Hellat,[6] Goldschmidt,[7] Cornil and Babès,[8] Wheeler,[9] Morrow,[10] Boinet,[11] Thoma,[12] Cantlie,[13] Bouchard,[14] Bourns,[15] Manson,[16] Stullard,[17] Olavide,[18] Gibbs,[19] Dock,[20] Chacon,[21] Looft,[22] and a host of other investigators whose writings have been consulted and whose names might be cited, men who have studied leprosy from every standpoint, unite in the opinion that the *bacillus leprœ* is always present in leprosy, and is its specific cause.

FIG. 1.



Lepra bacilli. (After CORNIL and BABÈS.)

From the enormous quantities of the bacilli always present in leprous tissues, more especially after the process of tuberculization has commenced, Cornil and Babès think leprosy the most classical type of bac-

[1] AMER. JOURN. MED. SCI., July, 1891.
[2] London Lancet, January, 1892.
[3] Journ. Lepr. Invest. Com., No. II.
[4] Ibid.
[5] Arch. f. Derm. und Syph., January, 1891.
[6] Journ. Lepr. Invest. Com., No. IV.
[7] Ibid.
[8] Les Bactéries.
[9] Journ. Lepr. Invest. Com., No. II.
[10] Journ. Cut. and Gen.-Ur. Dis., Jan., '90
[11] Rev. de Méd., 1890.
[12] Deutsche Arch. f. klin. Med., 1890-91.
[13] Brit. Med. Journ., May 4, 1891.
[14] Enfer. Infec.
[15] Intern. Med. An., 1891.
[16] Journ. Lepr. Invest. Com., No. I.
[17] Brit. Med. Journ., Dec. 21, 1889.
[18] Rev. Cl. de los Hosp., Dec., 1889.
[19] Pract. Path. and Morb. Hist.
[20] Trans. Tex. State Assoc., 1889.
[21] Gacet. Med. Mex., Nos. III. and IV.
[22] Centr. f. d. Med., 1891.

terial diseases. They say :[1] "Bien que le contrôle de l'expérimentation nous fosse défaut, les bacilles sont tellement nombreux dans toutes les cellules lèpreuses et dans toutes les lésions de la lèpre, depuis le début des tubercules et pendant toute leur durée, les lésions sont tellement inséparables des bacilles, qu'il est évident que la lèpre est le type le plus net des maladies bactériennes."

The writer has examined thirty cases of tubercular and five cases of macular leprosy, with reference to the presence of bacilli, and has never failed to find them in sections of tubercles, in blood drawn directly therefrom, in discharges from leprous ulcers, and, occasionally, in the sputum and the secretions from the nose; but he has never found them in the feces, urine, or blood, only when the latter was taken directly from a tubercle, although other investigators—Köbner, according to Thoma,[2] and Cantlie[3]—claim to have found them in the blood-current.

The bacilli were plentiful in the sputum and nasal secretions of the subjects of photos Figs. 4, 6, and 8. They were also found in discharges from ulcers in the same subjects, and in a section of skin from the macular spot on the left arm of the subject of Fig. 3.

Fig. 1 is a fairly good representation of lepra bacilli as seen in the skin of lepers. It is copied from Cornil and Babès' *Les Bactéries.*

Thin,[4] Tache,[5] Münch,[6] Hellat,[7] Sir William Moore,[8] White,[9] Cayley,[10] and, indeed, with one or two notable exceptions, nearly every author whose work the writer has been able to consult, agree—for there seems to be a more general consensus on this point—that, aside from the enervating influences of such environments on the one hand, or their tendencies to physical well-being on the other, and which apply with equal force to all ailments, the origin and spread of leprosy is neither dependent upon nor affected by race, climate, altitude, occupation, food, dwelling, or economical, social, or political conditions.

The opinions of these eminent gentlemen are in strict accord with the writer's experience in Mexico. He has seen the disease, as an endemic one, on the shores of the Mexican Gulf, and high up in the Sierra Madre mountains; in wet, marshy districts, and on dry, *buena vista* tablelands; in its hot, sultry, southern climate, and in its even, temperate, northern exposure; in the palaces of its hidalgos, and in the *jacales* of its peons—among all classes and occupations of its people; but it is more prevalent among the poor than the rich, doubtless because the former class largely predominate and is less mindful of personal hygiene and other protective measures.

[1] Loc. cit.
[2] Loc. cit.
[3] Loc. cit.
[4] London Lancet, January 16, 1892.
[5] Journ. Lepr. Invest. Com., No. III.
[6] Ibid.
[7] Journ. Lepr. Invest. Com., No. IV.
[8] Journ. Lepr. Invest. Com., No. I.
[9] Int. Ency. Surg., Ashhurst.
[10] Journ. Lepr. Invest. Com., No. I.

As prominent among those not in entire accord with the views above stated, Mr. Jonathan Hutchinson,[1] Francis,[2] Roussel,[3] Thoma,[4] and Ashmead[5] may be mentioned. Mr. Hutchinson contends "that in all former ages when leprosy was prevalent, and in all the various lands where it is now still found, it has had, and still has, one and the same cause—being the taking into the system, in the form of fish food, the poisonous germs of the malady; . . . that the advance of Christianity, with its salt-fish feasts, and not the Crusades, was mainly conducive to the general spread of the disease in Europe during the Middle Ages; that its spreading is always due to food, and never to contagion."

According to his idea, it is not necessary to consume large quantities of fish—a small fragment being sufficient, if containing the bacillus—in order to introduce the germ directly into the stomach and produce the disease. He writes, *loc. cit.:* "It may be by direct introduction of the bacillus into the stomach," or "it may be that some element in fish food rouses into activity a bacillus already existing in the tissues. The first is the more probable supposition, and if it be true, it is obvious that very small quantities of fish, if containing the bacillus, may be efficient to produce the disease," and "that the development of the parasite is further favored by a diet of fish. Thus the greater severity and rapidity of the disease in countries where it is endemic, and the fewness of recoveries there, may be explained."

Francis accuses unsound vegetables; Roussel sees in fish diet a cause—Thoma, bad fish and insanitary conditions—that may facilitate its transference, while Ashmead recognizes the Japanese custom of eating raw fish as having value in defining the etiology of leprosy. These gentlemen, with Mr. Hutchinson, are, perhaps, the best-known exponents of the "intermediary host" theory of the transmission of leprosy.

That race plays no part in the cause of leprosy is evidenced by the fact of its occurring among all races; that climate does not, by its presence in all climates; that altitude does not, by the fact that it exists down by the seashore and up on the mountain-tops; that occupation does not, for the reason that persons of all vocations have it; that food does not, because found among those eating every variety of food; that dwellings do not, by its visits to palace and hovel; that economical conditions do not, by its ravages among the rich and the poor; that social and political conditions do not, by its attacking both ruler and subject; that fish-eating does not, by its infesting semi-desert districts where fish is unknown; that meat of no kind does, by vegetarians having leprosy; and that vegetables do not, by meat-eaters not escaping it.

[1] Journ. Lepr. Invest. Com., No. I.
[2] Ibid.
[3] Journ. Lepr. Invest. Com., No. II.
[4] Loc. cit.
[5] Journ. Cut. and Gen.-Ur. Dis., vol. viii.

Mitra,[1] Castor,[2] Pacha,[3] Blanc,[4] Hood,[5] Goldschmidt,[6] Koch,[7] Navarro,[8] Wheeler,[9] Hicks,[10] Moore,[11] Manson,[12] Murray,[13] Francis,[14] Phillippo,[15] Danielssen,[16] Macnamara,[17] White,[18] Boinet,[19] Chacon,[20] Lovell,[21] Boeck,[22] and many others, regard heredity as potent in the etiology of leprosy. Of eighty cases examined by Boinet, with regard to heredity, fifteen cases were undoubtedly due to this cause; nevertheless, while admitting these figures to be inadequate, since lepers do not readily acknowledge heredity, Boinet does not attach a great deal of importance to heredity as a cause, believing that many cases regarded as hereditary are merely examples of "heredo-contagion."

Navarro,[23] a man of forty years' experience with lepra in Vélez, reports that in 1847 he delivered a woman of a male child covered with leprous spots over the whole cutaneous surface; that in two months leprous tubercles developed on the child's face, elbows, and knees; that the mother and sister, until then quite healthy, soon afterward showed symptoms of leprosy, and that all these cases died of it in less than two years. Again, in 1848, he delivered a woman, in the last stages of "elephantiasis," of a well-formed female child whose body was covered with leprous spots. On the upper portion of the concha of the left ear of this child were also well-developed leprous tubercles.

Hood[24] has seen the infant of a woman with tubercular leprosy developing that form of the disease when only a few months old.

Goldschmidt[25] declares, after twenty-five years' experience, that one-half of the cases may be traced to heredity; while Manson[26] expressed the belief that it would be "difficult to conceive that the lepra bacillus could be handed down from father to son, or from grandfather to grandson; nor is it at all reasonable to suppose," he continues, "that leprosy becomes developed in collateral descendants of a common ancestor in consequence of the transmission of the bacillus itself through the semen or ova of intervening relatives, who themselves, very likely, were not leprous. Such a supposition seems absurd; but . . . we can understand that the appearance of heredity is brought about by the transmission of a physiological tendency to the production of a certain substance the possession of which is absolutely necessary for the development of the disease, and without which no one can become a leper. As

[1] Loc. cit.
[2] Journ. Lepr. Invest. Com., No. II.
[3] Voyages chez les Lépreux.
[4] Journ. Lepr. Invest. Com., No. II.
[5] Ibid.
[6] Loc. cit.
[7] Journ. Lepr. Invest. Com., No. IV.
[8] Rev. Méd. Bogotá, Nov., 1890.
[9] Journ. Lepr. Invest. Com., No. II.
[10] Ibid.
[11] Loc. cit.
[12] Ibid.
[13] Journ. Lepr. Invest. Com., No. I.
[14] Ibid.
[15] Ibid.
[16] Ibid.
[17] Brit. Med. Journ., Dec. 28, 1889.
[18] Loc. cit.
[19] Rev. de Méd., August, 1890.
[20] Loc. cit.
[21] Journ. Lepr. Invest. Com., No. II.
[22] Ibid., No. I.
[23] Rev. de Méd., August, 1890.
[24] Loc. cit.
[25] Loc. cit.
[26] Loc. cit.

with the tubercle bacillus, so with the lepra bacillus: certain individuals, with certain physiological characteristics, which are more or less hereditary, alone being susceptible."

Manson's hypothesis—and it need not, *per se*, exclude direct transmission of the bacillus from mother to child, more especially if, as claimed, these organisms have been found in the blood and lymph currents—recognizes as the cause of leprosy, the bacillus lepræ, "an organism very refractory to cultivation, growing only in a medium which, so far as known, exists only in the bodies of certain human beings. It is not present in everyone." Nor, in those in whom it is produced, is it present at all times; nor, when present, is it always so in equal amount. The bacillus escaping from the body of a leper, finds lodgment in a healthy person possessing this medium, and commences and continues to develop as long as supplied with this particular pabulum; but should this supply become exhausted, the bacilli pass into a condition in which they are powerless to resist the action of certain cells—which are not phagocytes, as they do not destroy the bacilli—into which they become incorporated—*i. e.*, they pass into or are taken within these cells, and remain *hibernating*, as it were, until supplied anew with this pabulum, when they enter again on a fresh phase of activity, they become extra-cellular, and are carried by the blood and lymph to other parts of the body, where they set up "additional lepra centres. In this way the disease extends and old lesions are enlarged by local multiplication of the bacilli until the pabulum is again exhausted. The bacilli then enter, or are taken into, the cells again. This recurrence of events continues until the patient dies by gradual extension of lepra lesions, or by intercurrent disease." If, on the other hand, the bacillus enters the body of one who never produces this medium, or in one who does not produce it in sufficient quantities, or in one in which it is not produced in time, the parasite either dies or remains undeveloped and innocuous.

Manson thinks this hypothesis—and it seems as reasonable as any one of the many brought forward to explain certain phenomena of leprosy—explains the prolonged incubation period in so many cases; the difficulty in inoculating man and the lower animals; the quiescence and exacerbations so often seen in the disease; failure to cultivate the bacilli on artificial media; the lifetime immunity of persons in daily intimate association with lepers, and many other phenomena connected with leprosy.

Some writers, while not admitting the disease to be hereditary, look upon heredity as predisposing to it. Thin,[1] after tracing the malady through five generations, says: "It is only in recent years that a sufficient analysis of facts has shown the fallacies that have led to the accept-

[1] Loc. cit.

ance of the idea that leprosy is hereditary." He points out, as a well-known fact, the disposition of the disease to hang to certain families.

Kaurin[1] never saw a congenital case of leprosy; does not believe it hereditary, but acknowledges that persons of "hereditary taint" are more liable to contract the disease, on equal exposure, than those not thus vitiated. Tache[2] shares this opinion, as does Arning,[3] Münch,[4] Hellat,[5] Lima,[6] and many others; while Hansen[7] thinks, if at all hereditary, it is very limitedly so. Arning[8] says: "To my mind the theory of hereditary transmission of leprosy must ever appear as an heirloom of a past and gone era in the science of pathology."

To those requiring stronger evidence of hereditary transmission of leprosy than that recorded on the preceding pages, the histories of the following cases, from the writer's personal experience, will carry but little conviction with them:

The subject of Fig. 2, aged twenty-eight years, a shepherd by occupation, is the only child of a leper mother who died of puerperal fever at his birth. Her mother, a brother, and two sisters were lepers. When she married she moved to a distant place from where she was raised, *to a locality where leprosy had never been known.* He was born four years after his mother married; was raised on goat's milk; never saw a leper; had never left locality where he was born and raised until he did so to consult the writer; had lived, since ten years of age, out of doors, herding goats, high up in the Sierra Madre mountains; was never vaccinated; never had syphilis, nor gonorrhœa, nor skin eruptions. His food for most part has been goat's milk and flesh, eggs, beans, coffee, tortillas and dried fish occasionally. Nodules began on the ear and face at twenty, and gradually extended until they became plentiful on his hands, forearms, feet, and legs, with now and then an ulcer. Sections of skin from one of the tubercles, stained with the Ziehl-Neelsen carbol-fuchsin, showed lepra bacilli in great numbers.

The father, mother, two brothers, and three sisters of the subject of Fig. 3, had leprosy. She is the youngest child. Aged thirty-five; married; mother of five healthy-looking children and the wife of a ranchman in easy circumstances. At birth she was given to a childless aunt, who carried her at once a hundred miles away from place of birth and where leprosy was unknown. Never nursed her mother; was raised on asses' milk; never saw a leper and has had no direct communication with her own family nor with any other having leprosy. Has lived in the locality where she was raised and has never visited leper districts. Her food has been liberal, nutritious, and varied, and often contained fresh and dried fish.

Her attention was attracted, eight years ago, to an oval-shaped spot on the right arm, which was soon followed by another on the left. Since then the spots have slowly increased in size and multiplied in number, until she now has them on both shoulders, breasts, legs, and feet. The circular spot to be seen on her left forearm began some six

[1] Loc. cit. [2] Loc. cit. [3] Loc. cit. [4] Loc. cit.
[5] Loc. cit. [6] Journ. Lepr. Invest. Com., No. IV.
[7] Journ. Lepr. Invest. Com., No. I. [8] Loc. cit.

months ago as a small, dusky, rose-colored discoloration of the skin. As it increased in circumference its central hue grew lighter and lighter until it became almost white. Within this spot—and all the others present the same characteristics—more marked in and nearest the centre, the sensibility is diminished to almost complete anæsthesia. Both ulnar nerves are enlarged and sensitive; the fingers and toes are clumsy, somewhat anæsthetic and formicating.

On the left side of the face three tubercles may be seen; there is also one on the lobule of the right ear. The first to appear, about two years ago—that on the cheek—being much the largest of the three. A section of skin from this tubercle contained enormous quantities of bacilli—twenty times as many, or more, than in skin taken from the spot on the left arm. (Philippson[1] reports having found "swarms" of bacilli in skin taken from acute erythematous patches of lepra; but the writer has never seen them in such quantities, except in skin from tubercles.)

The life-period of the bacillus lepræ is unknown—no culture experiments having, as yet, been successful; but if it be like that of its congeners of lupus and tuberculosis, capable, under favorable conditions, of prolonged hibernation and of resuming vital activity when influenced by propitious circumstances—the presence of Manson's "cultivating medium," whatever that is—the fact that the disease it engenders, like lupus and tuberculosis, while it may appear at any period of life, is seen with greatest frequency between the ages of ten and thirty years, is, in the writer's humble judgment, a stronger argument in favor of than against heredity.

The statement of non-believers in the hereditary transmission of leprosy, that the disease renders the male impotent, is true only after it has made considerable progress, and is not always true even then; it does not apply to the female at all. The original of Fig. 6 has been under the writer's observation for the last ten years; he was a confirmed leper when first seen, and his youngest child is but three years of age. The original of Fig. 2, taken four years ago, himself the son of a leper mother, had a child born to him since his photograph was made, while the mother of the subjects of Figs. 4, 7, and 8, and the mother of the subject of Fig. 3, bore numerous children after becoming lepers, if, indeed, either of them were ever otherwise than lepers, for, from information furnished by reliable parties, the families of both, for several generations back, have contained male and female lepers—families to which leprosy has clung for ages.

If, as seems proved beyond controversy, the bacillus of leprosy, let it enter the human economy howsoever it may, is taken up by the leucocytes and other cells and circulates in the blood and lymph currents to internal organs, such as the liver, spleen, medulla of bone, etc., the writer knows of no reason why it may not, with equal facility, be carried

[1] Monats. f. prakt. Derm., No. 9, 91.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 5.

*

to the fœtus *in utero*, and in this way directly transmit the germ, if not the disease, by inheritance. When it is remembered that Birch-Hirschfeld and Schmal [1] have recently found tubercle bacilli in the umbilical cord and in the blood of the umbilical vein, and that Solles [2] has produced tuberculosis in guinea-pigs by inoculating them with spermatic fluid taken from the seminal vesicle of a tuberculous subject, the difficulty of conceiving how lepra bacilli may be handed down from parent to child fades into absolute nothingness.

In September, 1884, Arning [3] inoculated, in the Hawaiian Islands, a man by the name of Keanu—who was thought to be free from all leprous taint—with leprous material taken directly from a child who had severe tuberous leprosy, and who had just gone through leprotic fever. The inoculation was made by introducing a small piece of the leprous nodule under the skin of the left forearm. In four weeks Keanu had rheumatic pains in the left shoulder, followed by pain in the joints of the arm and swelling and pain in the ulnar and median nerves, without fever. Within six months the neuritis decreased, and a small leprous nodule formed where the inoculation had been made. Sixteen months later lepra bacilli were still to be detected at the point of inoculation. In September, 1887, Keanu showed distinct symptoms of leprosy, and in another year the disease was at its acme.

This case was for a time thought demonstrative of the inoculability of leprosy, but it soon came to light that a son, a nephew, and a cousin of Keanu had leprosy, when it began to lose prestige as such, until to-day it is regarded as proving nothing whatever in that direction. Notwithstanding this, however, and notwithstanding that efforts to inoculate healthy persons with leprous material have failed in Norway and Italy, many, experienced in the management and care of the disease, regard it as inoculable, while others of equal opportunities deny that it is. Mitra [4] says: "Contagion by inoculation is possible and often occurs; . . . and that all the different ways by which syphilis can be passed from one individual to another, extra-genitally, hold good for leprosy."

Arning,[5] Murray,[6] Cayley,[7] Francis,[8] Hederstam,[9] Manson,[10] Swift and Montgomery,[11] Olavide,[12] White,[13] Wilson,[14] Martin,[15] Bakewell,[16] Fox,[17] Castor,[18] Ebden,[19] Bemiss,[20] Hildebrandt,[21] Mouritz,[22] Gairdner,[23] Black,[24]

[1] Beiträge zur. path. Anat. u. zur. allg. Path., 1891.
[2] Journ. de Méd. de Bordeaux, 1892, No. 5. [3] Loc. cit.
[4] Loc. cit. [5] Loc. cit. [6] Loc. cit. [7] Loc. cit.
[8] Loc. cit. [9] Journ. Lepr. Invest. Com., No. I. [10] Loc. cit.
[11] Occid Med. Times, September, 1890. [12] Loc. cit. [13] Loc. cit.
[14] London Lancet, August 22, 1891. Abstract of Dr. Abraham's paper before Internat. Cong. of Hygiene, 1891.
[15] Ibid. [16] Ibid. [17] Ibid. [18] Ibid. [19] Ibid. [20] Ibid.
[21] Ibid. [22] Ibid. [23] Ibid. [24] Ibid.

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 9.

Brunt,[1] Daubler,[2] Piffard,[3] Hillis,[4] Leloir,[5] and others, are of the opinion that the disease is inoculable, some of them reporting cases in justification of their faith.

Abraham,[6] analyzing these and other reported cases of supposed inoculation by vaccination and otherwise, admitted that instances have, occasionally, been reasonably demonstrated of its communication from one infected person to another previously healthy, contends that "Even the most suspicious cases . . . are open to the objection that there is nothing to show that the subjects had never been exposed to any other possible means of inoculation or contagion, had never been in contact with lepers, or had never had to do with food or anything else which might have been contaminated by lepers; in short, one could not be sure that having been born, or having lived for some time in a leper land, they had not been exposed to other pathogenic conditions of the disease; . . . and that while up to the present time no absolutely clear and incontrovertible evidence connecting vaccination with leprosy had been forthcoming," he admits, "*a priori*, the possibility of an occasional accidental inoculation of the disease in this way," and thinks medical men should exercise extreme care in selecting vaccine lymph, and should avoid indiscriminate arm-to-arm vaccination where leprosy is endemic.

Donovan[7] can find no evidence in support of the idea that leprosy is communicated by vaccination; neither can Ashmead,[8] nor Rake and Buckmaster.[9]

These latter gentlemen, members of the "Leprosy Investigation Committee," vaccinated eighty-seven patients at the Almora Asylum, Robbens Island, in 1891, from which they made ninety-three microscopical preparations, in no one of which did they *undoubtedly* find lepra bacilli. "Suspicious-looking rods taking fuchsin were seen in one case in vesicles raised over tuberculated ears, and in another case in vesicles over anæsthetic patches."

Looking at the subject from every side, Rake and Buckmaster conclude "that the risk of transmission of leprosy by vaccination is so small, that for all practical purposes it may be disregarded."

Very many physicians in Mexico, those who have seen much of leprosy—laymen also—recognize the *a priori* danger of transmitting it by vaccination; but the writer has never met a leper who claims to have been inoculated in that way; and in every case claiming to have been inoculated at all, he has ascertained the possibility of the disease being contracted in divers other ways. The majority of them date the beginning of their malady from getting wet in cold weather—possibly from the rheumatic pains so constant in the early stage of leprosy.

[1] Ibid. [2] Ibid. [3] Ibid. [4] Ibid. [5] Ibid. [6] Ibid.
[7] Loc. cit. [8] Loc. cit. [9] Journ. Lepr. Invest. Com., No. IV.

The efforts to cultivate lepra bacilli, made by Rake and Buckmaster,[1] Kanthack and Barclay,[2] Abraham and Crookshank,[3] Koch,[4] Christman,[5] Stallard,[6] and others, have all failed, and if the experiments being made by Campana[7] be not successful, then, in the language of Hansen[8] and of Stuart,[9] it may be said that, up to this time—April 20, 1892—"nobody has succeeded in cultivating the bacillus of lepra."

Equally futile have been the attempts of Kaurin,[10] Goldschmidt,[11] Favarat,[12] Christman,[13] Rake,[14] Kanthack,[15] Barclay,[16] Campana,[17] the writer, and many others to inoculate the lower animals with lepra bacilli; and the claim made by Bordoni-Uffreduzzi, in Turin, of having cultivated the bacilli from the marrow of bone, and that of Ortmann, of successfully inoculating it on rabbits, has not been substantiated by others, and is generally regarded as a mistake.

The contagiousness of leprosy is asserted and denied with much vehemence by a great many whose position and experience should constitute them competent judges in the premises. Very much the same argument is used against the contagiousness of leprosy as that relied on to disprove its inoculability and transmissibility by heredity, viz.: that all the reported cases of supposed contagion lived, or had lived, in localities where lepra was endemic; hence they might, with equal propriety, be considered examples of infection. The well known case of Father Damien may be given as one in point. It was once very generally accepted as tending to establish the theory of contagion. But it is now number of years, and then developed leprosy, he may have absorbed urged by Rake[18] and others, that as "he lived in a leper colony for a the specific virus in many other ways, *e. g.*, in food, water, air, etc." Rake then refers to a case reported by Dr. Hawtry, of a man who "returned to Ireland, after many years of service in India, and developed leprosy, of which he died. His brother, a laborer, who had never been out of the United Kingdom, slept in the same bed with him, and in course of time he, in his turn, became a leper. Except his brother's, no case of leprosy had occurred in the neighborhood, according to tradition, for centuries."

In all reported cases of contagion Hutchinson[19] thinks the food hypothesis equally probable with that of contagion: and Mitra[20] "can only cite one case, that of a wife from her husband, where a leper has transmitted the disease to any member of his family, however intimately

[1] Brit. Med. Journ., June 27, 1891.
[2] Brit. Med. Journ., August 27, 1891.
[3] Journ. Lepr. Invest. Com, No. IV.
[4] Ibid.
[5] Centralbl. f. Bakt. u. Parasit., x. 1890, iv.
[6] Occid. Med. Times, April, 1890.
[7] Journ. Lepr. Invest. Com., No. IV.
[8] Loc. cit
[9] Vierordt's Med. Diagnosis.
[10] Loc. cit.
[11] Journ. Lepr. Invest. Com., No. IV.
[12] Ibid. [13] Ibid.
[14] Loc. cit.
[15] Brit. Med. Journ., June 6, 1891.
[16] Ibid.
[17] Journ. Lepr. Invest. Com., No. IV.
[18] Loc. cit. [19] Loc. cit. [20] Loc. cit.

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they may have commingled," and as already stated, believes it "contagious by inoculation." Taché[1] holds "contagion as the cause of the propagation of the disease." Blanc[2] thinks the disease "may be communicated by a leprous person by means of a specific virus, which acts somewhat like the specific poison of syphilis, depending upon a thin or denuded surface for its absorption, and which remains potent, very probably, for an indefinite period of time." Arning[3] contends that it is contagious. Münch[4] ranges himself "on the side of the deeply convinced believers in its contagiousness." Lima[5] cites cases of supposed contagion "sufficiently eloquent to render unnecessary further illustration." Thin[6] traced sixty cases of leprosy in Parcent, where the disease did not exist before, to infection from a leper who went there in 1850. Donovan[7] says: "There is no longer any room to doubt that leprosy may be classed among parasitic diseases, and is consequently infective, its products being specifically contagious." According to Hellat,[8] the "rapid increase through free communication and the just as rapid decrease of the disease by isolation, are explained without difficulty by means of infection." Goldschmidt[9] concludes, after twenty five years' experience, and after having to do with most of the known cases in Madeira, "that infection is directly propagated from man to man, or what was in immediate contact with the diseased body." Koch[10] asserts that "the fact appears clear enough that under certain conditions, about which we at present know little, the disease may be transmitted by contagion." Cornil and Babès[11] define leprosy as a chronic infectious malady.[12] Hicks[13] declares there is the strongest evidence that the disease is contagious. Simmons[14] reports several cases of contagion; while Wheeler[15] thinks that "it requires hereditary tendency for infection." Ross[16] looks upon the question of contagion as an open one, but writes: "It is demonstrable that leprosy is communicable, to some extent, in the same sense as cancer or syphilis." Boinet[17] analyzed eighty cases and found the possibility of direct contagion in fifty-one. Hillis[18] writes: "A further experience of ten years has convinced me more firmly than ever that leprosy is a communicable disease;" and Castor[19] thinks "there is sufficient evidence found even in lay journals that it is communicable." Bouchard[20] deplores the false and dangerous security hidden in the "optimistic chimera" that leprosy is not contagious. Moore[21] asserts: "After the number of cases which have been reported, there seems no

[1] Loc. cit.
[2] Loc. cit.
[3] Loc. cit.
[4] Loc. cit.
[5] Loc. cit.
[6] London Lancet, January 16, 1892.
[7] Loc. cit.
[8] Loc. cit.
[9] Loc. cit.
[10] Loc. cit.
[11] Loc. cit.
[12] La lèpre est une maladie infectieuse chronique.
[13] Brit. Med. Journ., November 8, 1890.
[14] Journ. Lepr. Invest. Com., No. III.
[15] Journ. Lepr. Invest. Com., No. II.
[16] Journ. Lepr. Invest. Com., No. II.
[17] Journ. Lepr. Invest. Com., No. III.
[18] Journ. Lepr. Invest. Com., No. II.
[19] Journ. Lepr. Invest. Com., No. III.
[20] Enfermedades Infecciosis.
[21] Loc. cit.

reasonable doubt that leprosy may be communicated from one individual to another." Cayley[1] and Murray[2] share this opinion; and Phillippo[3] distinctly states his opinion "that it is contagious." Heidenstam,[4] after eleven years' service in the leper asylum in Cypress, "is more than ever convinced of the communicability of lepra." Lutz[5] thinks "infection from one person to another responsible for the larger number of lepers in Honolulu." "Archdeacon Wright[6] has published a book in which he has brought together evidence collected from various sources, . . . showing that leprosy is contagious; and Mr. Macnamara has published a second edition of a pamphlet originally published in Calcutta in 1866, in which he expressed the opinion that leprosy was communicable. Zuñaga has published facts observed by him at the village of Limat Valldigna, Spain, which appear to point very unmistakably to the transmission of leprosy by contagion." Stallard[7] and White[8] regard the spread of leprosy in the Sandwich Islands as affording absolute proof of contagion. Olavide,[9] in an experience of twenty-five years, and after investigating five hundred cases, has never seen any evidence of transmission of leprosy by contagion, and has never seen but one case who claimed to have contracted the disease in that way; he thinks, *a priori*, the disease should be contagious. Macnamara[10] reports a case of contagion, and says the disease "is contagious, not in the same way as we understand this expression when applied to such diseases as the exanthemata, but slowly, in such manner as it is now held that phthisis pulmonalis is contagious . . . it is a disease which is slowly contagious under certain conditions of environment and individual idiosyncrasy."

Of leprosy in Crete, Biliotti[11] writes: "That it is not contagious, or is very slightly so, is proved by the fact that there are several cases of healthy women married to and living with lepers for years without being in the least affected." Dixon[12] says: "The evidence gathered from officials and patients, long resident on Robbens Island, shows that there is no authentic instance, with possibly one exception, of any non-leprous person on the island having contracted the disease from contact, either directly or indirectly, with leper residents." Flinders[13] writes from New Zealand "that the immunity from the disease, enjoyed by women who have lived for years with leprous men and *vice versa*, makes it difficult to believe that it is infectious or contagious in the ordinary sense." Bulkley[14] thinks "the disease is not contagious in the ordinary acceptation of the term,

[1] Loc. cit.
[2] Loc. cit.
[3] Loc. cit.
[4] Journ. Lepr. Invest. Com., No. I.
[5] Journ. Lepr. Invest. Com., No. I.
[6] Brit. Med. Journ., Dec. 28, 1889.
[7] Brit. Med. Journ., Dec. 21, 1889.
[8] Int. Ency. Surg., vol. ii.
[9] Rev. Clin. de los Hosp., Madrid, 1889.
[10] London Lancet, March 26, 1892.
[11] Journ. Lepr. Invest. Com., No. III.
[12] Loc. cit.
[13] New York Medical Record, No. 1113.
[14] New York Medical Record, No. 1113.

as applied to such diseases as smallpox, scarlatina, or syphilis," but admits "there is evidence that when acquired the disease may, under favorable conditions, be transferred from one person to another;" and, finally, Hansen[1] says: "It is said that it is not contagious in the ordinary sense of the word; probably I do not know what the ordinary sense of the word is; but if someone would say communicable instead of contagious, I would not object. . . . I, for my part, prefer what is plainest and most intelligible, and that is the contagion hypothesis."

The subjects of Figs. 5 and 6 illustrate most aptly the fact that lepers may live for years with the healthy without imparting the disease in any, as yet, recognizable shape. That of Fig. 5—the only member of his family who ever had leprosy—resided for *sixty-two years in a locality where the disease has been endemic for the past two hundred years; where 30 per cent. of his neighbors are lepers; on terms of the most unrestricted social intimacy with lepers in every stage of the disease; using the same utensils, sleeping often in the same bed, in rooms without ventilation; drinking from the same goblets; wearing the same clothing; dressing the ulcers of, and caring for, his "unclean" friends without limit or restriction whatsoever, without contracting the disease. He is now seventy years of age, and the victim of lepra tuberosa, having passed through the other two stages of the disease.* His disease commenced (*i. e.*, the writer has been his physician for ten years, and up to eight years ago he, the subject, declares he has never had a day of sickness since childhood, and he certainly looked the picture of health) with a burning, erythematous-looking eruption on both legs, midway between the knee and ankle, which gradually extended up and down and around the leg until it reached nearly to the knee and ankle, and had nearly surrounded the leg. *Pari passu* with the peripheral extension of the macula, its centre faded into a dusky white. In the meantime the legs began to swell, and the patient to complain of numbness and stiffness of the limbs with fugitive, rheumatic pains up and down, to the knees above and toes below. Pressure over the course of the musculo-cutaneous, anterior tibial, and internal saphenous nerves caused severe pain. As the maculæ gradually faded away—the skin never returned to its natural hue, but remained lighter in color—the pains subsided and the numbness increased to semi-anæsthesia; partial muscular atrophy following with loss of both little toes. A few maculæ, similar to the ones described, appeared on other portions of the body.

Four years from the (apparent) beginning of the disease in this case, tubercles formed on the lobules of the ears, nose, forehead, cheeks, lips, chin, hands, and feet, until they occupied these parts in as thick profusion as is seen in Figs. 2 and 4, and also in Fig. 1 of Duhring's article in THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, March, 1892.

The original of Fig. 6—as may be seen, a most repulsive looking object—has lived with his family in the same poorly-ventilated house; occupying the same bed; eating and drinking from the same vessels; in short, he has lived with them—four sisters, their husbands, their children, his wife and their children—in a locality where the disease

[1] Loc. cit.

has also been endemic for *two hundred years, surrounded by the most insanative of environments, without imparting the disease to any of them in any, as yet, recognizable form—they all appear healthy.* And so, also, with the father of subjects of Figs. 4, 7, and 8. He lived twenty years with a leper wife, and ten years with leper sons, under as unfavorable hygienic conditions as the cases recorded above, and is, to-day, April 20, 1892, apparently as healthy and vigorous as any man of his age (sixty) and physique.

Concerning the *treatment* of leprosy, there is as much difference in opinion as there is about the manner of its propagation.

Mitrá[1] found gurjun, chaulmoogra, and creolin useful to heal ulcers, but powerless to arrest the disease. Nerve-stretching, in his hands, was of palliative value in fifty cases of anæsthetic leprosy. Donovan[2] reports marked benefit from gurjun oil, internally and externally, in some cases. Taché[3] thinks attention to functional disorders, palliative treatment, attentive nursing, while working no cures, are highly beneficial. Lima[4] regards with favor applications of "gynocardic acid, the oil of *Gynocardia odorata*, and phenic acid; and in case of leprous fever, salicylate of soda. Externally, frictions of pyrogallic acid, ichthyol, and chrysarobin. For large leprous tumors, friction with vaseline containing sublimate, and the thermo-cautery of Paquelin, as excellent measures for their reduction." He claims that by these means patients sometimes gain "both in vigor and weight." Goldschmidt[5] has never obtained any "lasting benefit from any of the varied measures" he employed. Koch[6] summarizes the treatment of leprosy in the following language: "No drug has yet been used which exerts a specific action on lepro y; of the drugs used, chaulmoogra oil seems to act most beneficially."

Münch[7] asserts "that the efficacious action of certain drugs (creosote, oleum chaulmoogra, etc.), and the apparent convalescence of lepers during the period of florescence, could, with greater reason, be attributed to the more rapid passage, during the employment of one remedy or another, of the florescent stage into the regressive." He cites a case "whose infiltrations, after the use of creosote, disappeared entirely;" but, "on post mortem examination, an enormous number of lepra bacilli in the skin, nerves, nervous knots, lymphatic glands, spleen, liver, etc., proved the patient still leprous."

Rake,[8] writing of the results of two cases of amputation for leprotic gangrene, says: "Very much may be done by operative interference in leprosy, even in desperate cases;" and with regard to the use of chaulmoogra oil, he observed "increase of perspiration, decrease of tubercles,

[1] Loc. cit.
[2] British Medical Journal, August 8, 1891.
[3] Loc. cit.
[4] Loc. cit.
[5] Loc. cit.
[6] Loc. cit.
[7] Loc. cit.
[8] British Medical Journal, March, 1890.

improved appetite and sense of well-being, increase of sensation, increased suppleness of the skin, and lessening of pain in the joints."[1]

Roose[2] says some benefit may be derived from the remedies usually employed; while Pontoppidan[3] lauds salicylate of soda, especially in anæsthetic leprosy. He has seen it cut short the fever and stage of acute eruption, and cause absorption of newly formed tubercles in tubercular leprosy; but never saw any "permanent" benefit follow ichthyol, Unna's treatment, chaulmoogra oil, nor salicylate of mercury. In his experience, iodide of potassium always caused increase of eruption, and for this reason he thinks it of value in determining if a given case is cured; if no eruption follows its use, the case may be considered radically cured(?).

Bakewell,[4] commenting on the treatment of Beauperthuy, considers it could only be successful when commenced early in the disease. This method—the one he follows—consists of three parts:

1. Hygiene or dietetic, including removal to a healthy locality, good diet, cleanliness, separation from other lepers, and protection from infection from mosquitoes. 2. The use of external applications, especially the oil of cashew-nut (*Anacardium occidentale*), generally, of nitrate of silver to anæsthetic parts, and of liniments to other parts. 3. Internal medication by small doses of alkaline salts. Beauperthuy used mercuric chloride; Bakewell had not found it of value. Most reliance was placed upon the external treatment. The oil of cashew-nut produced sufficient irritation to cause slight oozing, which went on for a day or two and then dried and left a scab. When this fell off the tubercle was diminished in size. The process was repeated two or three times. In more chronic cases with much anæsthesia, a mixed solution of nitrate of silver and copper gave the best results. Care must be taken not to apply the oil over too large a surface—for example, never more than six inches square. Bakewell urged that treatment, both medical and hygienic, should be vigorously carried out in the early stage. Mr. Macnamara could not agree with the author's views as to the curability of leprosy. He had never seen a case which was even relieved by treatment, though it was true that there was a quiet stage during which apparent improvement took place. When once established, the disease advanced from bad to worse. Dr. Thin insisted that occasionally the skin lost its anæsthesia and became sensitive and the spots disappeared; this was generally due to the use of some external irritant. He thought the disease might be arrested, and mentioned that Mr. Hutchinson had shown a case to

[1] Journal of Leprosy Invest. Com., No. II.

[2] Leprosy and its Prevention.

[3] Monats. f. prakt. Derm., 1890, vol. x.

[4] Abstract of a paper read at a meeting of the Royal Medical and Chirurgical Society, May 27, 1890. British Medical Journal, May 31, 1891: also, Journal of Leprosy Invest. Com., No. I., and discussion thereon.

the Society. The woman was now well, whereas twenty years previously she was afflicted with marked tubercular leprosy. Dr. Abraham thought that a cure ought to be attempted, though it was not always easy to recognize the earliest symptoms. The disease was probably not curable, though it might abort and die out. The drug preferred by lepers themselves was chaulmoogra oil.

Bergé[1] extols this remedy (chaulmoogra oil), and gives notes of three cases in which it was employed with great benefit. The results seem remarkable. The dosage was ten drops of the oil in a spoonful of water three times daily, gradually increased until forty-five drops three times daily were taken without disturbance of the alimentary canal, except in large doses, when the bowels were acted upon too violently. The author thinks the oil should be regarded as a specific. Its absorptive properties were manifested in a striking degree upon the tubercular infiltrations; it afforded relief to the nervous phenomena, relieved the anæsthesia, and restored health to the body and mind.

Bourns[2] says reliance can only be placed in chaulmoogra and gurjun oils. Moore[3] writes: "Under the influence of tonics, oils, nourishing diet, good personal hygiene, and general sanitation, improvement often takes place, and the progress of the disease may, perhaps, be temporarily arrested. The cachetic leper becomes a robust leper; but the leper remains a leper." He knows of "no remedial agent which directly affects leprosy."

Murray[4] has exhibited most of the medicines in the Pharmacopœia, with temporary relief in many cases; but the disease soon resumed its active state. He found the inspissated milky juice of the *Calotropia gigantica* the most efficacious of any drug employed.

Van der Straaten[5] has known treatment by chaulmoogra oil, as an inunction and taken internally, to have been very beneficial in several cases.

Lutz[6] reports, after six months' work at the Kalihi Hospital, that several of the tubercular cases showed a marked improvement, no fresh symptoms appearing and the old ones diminishing gradually . . . and a similar effect on the large brownish pigmentations peculiar to the tuberous form in active state. He used chaulmoogra oil, gynocardic acid, salol, salicylate of soda, creosote, nitrate of silver, antipyrine, mercury, iodine, etc. He is of opinion that the principal treatment should be general, and directed against the first outbreak, the feverish and eruptive period, and to removing the deposits. He favors chrysarobin for this latter object, in a 5 or 10 per cent. solution.

[1] See AMER. JOURN. MED. SCI., April, 1892, p. 473.
[2] Int. Med. Ann., 1889.
[3] Loc. cit.
[4] Loc. cit.
[5] Loc. cit.
[6] Bien. Rept. of Pres. Bd. of Health, Honolulu, 1891.

Stallard[1] had proved to his own satisfaction that leprosy can be arrested and prevented by abundant good nourishing food and proper hygiene; while White[2] asserts there is no specific remedy for leprosy, but that it may be delayed by removal, at an early stage of the disease, to regions where it is not endemic.

Rake[3] resorted to nerve-stretching in one hundred cases; but the operation seemed of value only for the pain associated with ulceration, in which relief was often very marked.

"Leprosy is regarded by many as incurable, nevertheless reports of recoveries seem to be gradually increasing in number, although no new remedies have been discovered."[4]

Francis[5] reports a case of an Englishman, born in India but educated at home, who contracted the disease in India, returned to England, and was so far cured in three years that he looked "stout, ruddy, and in perfect health and spirits," and remained so up to the last information he had of him.

Kaurin,[6] while denying there is anything like a specific for any stage of leprosy, says that, "if taken at an early stage, the disease may be cured by good diet and regimen, by careful nursing of the skin, baths, and symptomatic treatment."

Blanc[7] reports recovery of a case of "maculo-anæsthetic" leprosy after prolonged use of chaulmoogra oil internally and pyrogallol locally.

Lima[8] looks upon the disease as incurable, but admits the occurrence of a few cases of "spontaneous recoveries."

Fox[9] publishes a case presenting all the typical lesions of leprosy, under his observation for many years, who recovered after the systematic use of chaulmoogra oil.

Hellat[10] regards leprosy as "incurable," and Wheeler,[11] Roose,[12] Abraham,[13] and White,[14] indorse this opinion.

In the discussion of Bakewell's paper before the Royal Medical and Chirurgical Society, already quoted from, Thin said he had seen "a case in which the anæsthesia of the skin had been got rid of by treatment;" and that a medical man practising in Jerusalem reported a case, under observation for several years, in which a cure appeared to have been effected.

Commenting on these cases, and those reported by Unna, Fox, and Hutchinson, and on the official report from the Norwegian Asylums, where thirty-five cases were reported cured within the last five years, Abraham said: "One did come across cases in the records of asylums

[1] Brit. Med. Journ., December 21, 1889.
[2] Int. Ency. of Surg., vol. ii.
[3] Brit. Med. Journ., December 28, 1890.
[4] Editorial, Med. News, No. 947.
[5] Journ. Lepr. Invest. Com., No. IV.
[6] Loc. cit.
[7] Loc. cit.
[8] Loc. cit.
[9] New York Med. Journ., February, 1890.
[10] Loc. cit.
[11] Loc. cit.
[12] Loc. cit.
[13] Loc. cit.
[14] Loc. cit.

in which the disease seemed, in course of time, to have died out or to have stopped its progress; from which it could be inferred that every case was not hopeless."

Phillippo[1] cured a case after nearly six years' constant use of gurjun and chaulmoogra oils. He thinks that "many of the reported failures with these oils are due to their improper and insufficient use, both as regards time and quantity. As a rule, it can only be properly done in specially appointed hospitals or asylums, where the necessary conditions obtain for such prolonged and troublesome treatment."

Tuberculin, in leprosy, seems to exert no marked influence in any way. Danielssen[2] treated with it five cases of anæsthetic, three of tubercular, and six cases of mixed leprosy for four months without benefit. Abraham[3] treated a case of tuberculous leprosy with tuberculin, with some improvement, and a case of macular leprosy, with marked benefit. Arning[4] could see no good results in two cases of tubercular variety on whom he used it; nor could Babès and Kalindero,[5] in seven; nor Donovan,[6] in three; nor Goldschmidt,[7] in five. Donovan noted increase in weight, and his patients professed feeling better in every way; but he could not appreciate any change in the appearance and character of the tubercles, atrophic changes, or anæsthesia. Ferrari,[8] analyzing the trials made with tuberculin by Goldschmidt, Martins, Joseph, Neumann, Arning, Hallopeau, Bardeleben, Babès and Kalindero, Maes, Kaposi, Watson Cheyne, Danielssen, and De Amicés, and detailing his own observations in eight cases in the tuberculous stage, concludes that it produces no direct beneficial action on the leper.

The writer has experimented for the past ten years with a great many drugs, on a great many lepers; and while he has seen some truly marvellous results—results he was in nowise prepared to witness—follow the use of certain measures, he is not prepared to assert positively that he has brought about a *radical cure* of a single case of leprosy, in either of its stages. Arsenical, mercurial, and iodine preparations, in his hands, when the disease was not associated with syphilis—and it is often thus associated—have been worse than useless; but he has seen such very marked improvement, in all three stages of leprosy, follow the systematic use of chaulmoogra oil, internally and locally, associated with an improved dietary and personal hygiene, in a sufficient number of cases to induce the belief that, while in no sense a specific, as regarded by Bergé, *if commenced early in the disease, and continued long enough and uninterruptedly, and associated with proper food and hygiene, it will cure the disease in many instances.* Of course, there are many cases it will not

[1] New England Med. Monthly, No. 10.
[2] Monats. f. prakt. Derm., August, 1891.
[3] Loc. cit.
[4] Loc. cit.
[5] Journal of Leprosy Invest. Com., No. II.
[6] Loc. cit.
[7] Berlin. klin. Wochenschr., January, 1891.
[8] "La Tuberculina Koch, nella Lebbra," Accad. Gioenia di Catania, May 24, 1891.

benefit, probably a large majority of them, but the writer has never seen it properly used without notable improvement, especially in the tubercular stage. *He has seen tubercles absorbed, anæsthesia removed, eruptions disappear, ulcers heal, pains quieted, suppleness and elasticity of the skin restored, and hope take the place of despair under its use.* The writer begins treatment with ten drops of the oil, in gelatin capsules, after each meal, to be taken with a glass of milk, the quantity to be gradually increased until from one to two drachms of the oil is taken daily; but few can take as much as two drachms daily without producing diarrhœa. At the same time the patient is bathed every second day with warm water and soap, the oil is warmed and well rubbed into the skin, over the entire body, including ulcers, maculæ, and all.

The subject of Fig. 6 has been the object of experiment for ten years. During that time he has been subjected to almost every variety of treatment (except tuberculin) without benefit, unless cod-liver oil with hypophosphites, which he took for one year, retarded the progress of the disease—and it seemed to do so, as it made no appreciable advance during that period. Ten years ago he was a confirmed leper in the tubercular stage, and when he commenced, one year ago, the use of chaulmoogra oil, was as hideous a specimen of suffering humanity as is often met with. He was covered from head to foot, with ulcers and tubercles. His mouth, lips, nose, cheeks, throat, and larynx were all extensively ulcerated; and he was entirely aphonic, and swallowed with the greatest difficulty. He has taken a drachm and a half of the oil daily for eight months, and has had it rubbed into the skin, with equal frequency, for a year. His improvement has been gradual and continuous, and on the 1st of March, 1892, he presented the appearance, repulsive as it still is, shown in Fig. 6. *All the ulcers are healed* but the one on the right jaw, the tubercles have almost entirely disappeared; he can now swallow without difficulty; his voice, although high-pitched and screeching, has, in a great measure, been restored. He has gained twenty pounds in weight; has returned to his former vocation, herding goats, and the poor creature, disfigured out of all recognition of his former self, is now hopeful of eventually ridding himself entirely of his dreadful enemy.

The writer regrets exceedingly not being able to exhibit a photograph of this case at the time he began using the oil; but, as with the subject of Fig. 5, nothing could induce him to be photographed—the appeal of family, friends, clergy, nor the offer of money.

Fig. 9 shows the condition of the subject of Fig. 8 on April 1, 1892, four months after the latter was made, and three months after treatment was commenced. He, too, had ulcers in the nose, larynx, and on the feet and legs, and was aphonic, but not to the extent of the subject of Fig. 6. Ulcers are nearly all healed; his voice, while stridulous, is greatly improved, and, as may be seen, the tubercles are notably diminished in number and in size, leaving, in many places, in their stead, a coppery discoloration of the skin. A section of skin, from one of the spots, the former site of a tubercle from which a section was taken before treat-

ment began, examined a few days ago, still contains numerous lepra bacilli, *but not one third as many as were found in the tubercle.*

One of the chief obstacles in the treatment of leprosy is inducing lepers to persevere in the methods employed. They soon lose all hope, regard themselves as social outcasts—although their liberties are not abridged in Mexico—become lethargic, indolent, careless, and often repel, in anger, the efforts of family and friends in their behalf; they seem to become de-humanized in the extreme.

In 1886 the writer had under observation a tubercular leper who contracted violent erysipelas of the head and face; upon recovery and after complete desquamation, it was noticed that *every small tubercle had disappeared and that the larger ones had greatly diminished in size wherever the erysipelas had been.* Remembering this case, and that Danielssen and Boeck,[1] Rake,[2] and Hardy[3] had observed complete disappearance of leprous tubercles after vaccination and after variola, he (the writer) concluded, notwithstanding Campana[4] is reported to have inoculated lepers with erysipelas without affecting the leprous progress, to inoculate the subject of Fig. 5 with erysipelatous material. This he did in November, 1891, and with the most gratifying results, so far as the leprous process was concerned. As already stated, the head, ears, face, nose, lips, etc., of this patient were once as thickly covered with leprous tubercles as were the corresponding parts of the subjects of Figs. 2 and 4, but when he recovered from the induced erysipelas, his face, etc., were almost smooth. He was at once placed on chaulmoogra oil, and is steadily improving. He has gained in weight and strength; the numbness of legs and feet are giving way to returning sensation; he walks with greater ease, and the remains of the tubercles on his face, hands, feet, and legs *have entirely disappeared.*

This experiment, crude in the extreme, was made with a bistoury smeared with blood from an erysipelatous subject, into a tubercle on the patient's forehead; and it came near costing him his life, for the disease that followed was of a most virulent type. This taught a wholesome lesson, and one not soon to be forgotten: *such crude inoculations are too dangerous for application even on lepers.*

Although questioned by some, it is generally regarded as true that leprosy was once almost entirely eradicated from among civilized people, by collecting lepers and confining them in hospitals and asylums erected for such purposes. So universal was this practice—the product of Christian influence—throughout the East during the thirteenth and fourteenth centuries, that it is said: "These buildings almost literally covered the face of the Continent, being numbered by thousands in every country. Every considerable town had one or more of them in its neighborhood, and scarcely a town or burgh in France was unprovided with such an establishment;"[5] and there are very many having to deal

[1] Brit. Med. Journ., June 3, 1891.
[2] Ibid.
[3] Ibid.
[4] Ibid.
[5] American Cyclopædia, vol. x.

with leprosy to-day who believe a return to, and a strict enforcement of, the segregation of former years will, in course of time, rid mankind once more and forever of this the most loathsome of diseases.

It is stated[1] that "Kunsamo, a little town in Finland, was for a long time a small but obstinate focus of leprosy. Sixteen deaths from that disease occurred there between 1774 and 1800, and twenty-two between 1801 and 1828. As the disease appeared to be spreading, it was determined, in 1801, to enforce isolation. A building was erected on a small uninhabited island in Lake Kitkajärvi, and the lepers were removed to that place. There they remained until 1845, when the hospital system was abolished, and the medical officer of the district was instructed to visit the lepers twice a year in their own houses, and to report on their condition to the authorities. These reports were made with regularity for twenty years, during which eleven cases of leprosy came under observation. After 1865 no further reports appear to have been presented, and in 1871 the medical officer reported he was unable to find any more cases of leprosy in Kunsamo. The stamping out, within a comparatively short period of time, of a disease which had probably smouldered on for centuries, may be commended to the attention of the opponents of segregation of leprosy."

Taché[2] writes: "Since the establishment of a lazaretto, in 1844, leprosy has been more or less kept in check in New Brunswick; and for several years past, especially during the last few years, it has undergone a notable diminution. The check and the decrease are in ratio with the more or less prompt resort to the lazaretto. Segregation is, in my opinion, the cause of the diminution of the disease."

Blanc[3] thinks communities "may rid themselves of this most loathsome, repulsive, and unclean disease, by rigid segregation;" implying thereby a lazaretto as a State institution, wherein lepers shall be properly cared for and interdicted all outside communication involving personal contact.

Münch,[4] being a "contagionist," naturally considers "that the only means for eradicating the disease is the isolation of lepers." He asserts that "isolation of lepers in a given locality stamps out leprosy," and cites many instances in southern Russia, in substantiation of his assertion.

Heliat,[5] member and founder of the Chief Committee for Stamping-out Leprosy, in the Baltic provinces of Russia, finds, in the theory of infection, "the way pointed out by which we may arrive at the annihilation of the disease. As long," he writes, "as it must be looked upon as incurable, isolation alone can lead to the goal."

Goldschmidt[6] says: "Complete isolation of all lepers and their families is the only reliable measure in order to quickly and totally eradicate the

[1] Brit. Med. Journ., Dec. 19, 1891.
[2] Loc. cit.
[3] Loc. cit.
[4] Loc. cit.
[5] Loc. cit.
[6] Loc. cit.

contagion . . . and ultimately making this loathsome disease completely disappear."

Wheeler[1] thinks leprosy "can be eradicated by separating the sexes in the asylums."

Roose[2] believes "the rigid system of isolation in vogue in Norway will, in a few years, work complete extinction of the disease" in that country.

Bouchard[3] declares: "Whenever and wherever man has wished to do so, he has been able to liberate himself from the ravages of leprosy, and that it may be entirely extinguished by proper isolation."

Hansen[4] says: "There can hardly be any doubt that segregation is the only right way, at least, after our experience here in Norway," for stamping out leprosy.

"There are grounds for hope for the diminution and even ultimate extermination of 'leprosy' in most parts of the world."[5]

There are those—men of experience in the management of leprosy, capable of forming correct conclusions concerning the disease—who deny that leprosy can be exterminated by segregation; but to particularize their opinions here would but add length to this already too lengthy article, without contributing correspondingly to its interest.

Although contradictory on many important points relating to the "nature of leprosy," it is believed that a proper appreciation of the facts and opinions recorded on the foregoing pages warrant, with reasonable certainty, the following conclusions:

1. That leprosy is a specific disease, due to the presence of the lepra bacilli.

2. That leprosy is influenced by race, climate, soil, food, etc., only in so far as these environments tend to enervation on the one hand, or to physical well-being on the other.

3. That experiments have not demonstrated leprosy to be inoculable on man or beast.

4. That leprosy is hereditary.

5. That leprosy is contagious, infectious, and communicable, under conditions not yet understood.

6. That leprosy is both mitigable and curable.

7. That chaulmoogra oil is a drug of unquestionable value in the treatment of leprosy.

8. That leprosy may be completely eradicated from the list of human ills.

[1] Loc. cit. [2] Loc. cit. [3] Loc. cit.
[4] Loc. cit. [5] Editorial, Medical News, March 7, 1891.